FORESTRY

FRDA REPORT 059
UBC INFORMS* NEWSLETTER
VOLUME 2-2

BY
SUE WATTS**, EDITOR

FOREST RESOURCE DEVELOPMENT AGREEMENT

Canada

BC

FRDA REPORT 059
UBC INFORMS* NEWSLETTER
VOLUME 2-2

BY
SUE WATTS**, EDITOR

*INtegrated FORest vegetation Management Systems

** Department of Forest Sciences
Faculty of Forestry
University of British Columbia

Departmental Representative:

David Haley
Forestry Canada
Pacific and Yukon Region
Pacific Forestry Centre
506 W. Burnside Road
Victoria, B.C.
V8Z 1M5

January, 1989

This report has been reviewed by Forestry Canada and approved for distribution. Approval does not necessarily signify that the contents reflect the views and policies of Forestry Canada. Mention of trade names or commercial products does not constitute recommendation or endorsement for use.

ISSN 0835-0752
ISBN 0662-16757-0
Fo29/19-59E

89-04913/

UNIVERSITY OF BRITISH COLUMBIA
FACULTY OF FORESTRY
FOREST SCIENCES DEPARTMENT

UBC INFORMS☆ NEWSLETTER

Volume 2•2

December 1988

Inside this issue:

The role of UBC INFORMS
INFORMS newsletter circulation
Update on UBC's WESTFORR group
BC MoF hires VM Technical Advisor
Research highlights
- Mycoherbicides in forest weed control
- Impact of herbicides on small mammals
- Habitat alteration and repellents for snowshoe hares
- Establishment of interior spruce and lodgepole pine
- Gel cap demonstration trial
- VM demonstration projects at the UBC Research Forest
- Bibliography and data base for interior weed species

Minutes of the November BC VM Research Committee Meetings
Upcoming meetings
Proceedings of recent VM meetings - now available
Some recent VM publications
Newsletters and Associations of interest to vegetation managers
The INFORMS bibliography and library - an update
Mailing list additions
Data base keyword listing

Editor: Sue Watts

☆ INtegrated FORest vegetation Management Systems

THE ROLE OF UBC INFORMS

The INFORMS project (INtegrated FORest vegetation Management Systems) was established in UBC's Forest Science Department in 1985. The overall role of the project has become one of vegetation management (VM) information exchange. Our current activities and commitments include the following:

1. Mouthpiece for the recently formed WESTFORR group at UBC (an update on which is included in this newsletter).

2. Maintenance of a computerized bibliographic data-base and library of VM publications together with a literature searching service as requested.

3. Production of a semi-annual newsletter covering VM research highlights, meeting schedules, activities of the BC Vegetation Management Research Committee, UBC updates and other relevant news.

4. Coordination of a series of on-campus discussion forums for VM researchers.

5. Development of a VM course for undergraduate forestry students at UBC.

6. Coordination of VM demonstration areas at the UBC Research Forest, Maple Ridge, B.C.

Project funding: Financial support for the INFORMS project is presently provided by a contribution from FRDA Federal Direct Delivery funds, a grant from the Council of Forest Industries, and funding from the UBC Forest Science Department.

• • • •

INFORMS NEWSLETTER CIRCULATION

The UBC INFORMS newsletter has been produced periodically over the past two years in an attempt to organize and formalize VM information exchange. Past issues have covered research highlights, updates on UBC's new WESTFORR group, meeting schedules, meeting reports, updates on UBC's computerized bibliography and other topics of general interest to its readership.

Effective this issue, the INFORMS newsletter is being published as a FRDA document by Forestry Canada. Further copies of this newsletter can be obtained from the address below:

Forestry Canada
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C.
V8Z 1M5
(604) 388-0600

The present circulation of this newsletter includes all MoF Regional Research Officers, Stand Tending Foresters, District Resource Officers-Silviculture, as well as interested individuals from the forest industry, government, university and consulting fields. The original INFORMS mailing list is being maintained under FRDA distribution. Any mailing list changes, deletions or requests for additions should be directed to Susan Watts at UBC - (604) 228-6316.

• • • •

UPDATE ON UBC'S WESTFORR GROUP

In the past year the provincial government has provided funding for several "Centres of Excellence" on the UBC campus. Forest regeneration was selected as one of the areas requiring additional staffing and research activity and, as a result of this new funding, several new appointments have been made possible. The new group is known as WESTFORR (WESTern FOrest Regeneration Research) and is comprised of new faculty appointments as well as existing faculty members and graduate students.

Mandate and goals of the WESTFORR group

- To increase our scientific knowledge of the determinants of forest regeneration and ecological succession.
- To focus our knowledge into research and decision support tools.
- To communicate this knowledge and these tools to managers, researchers, policy makers and the public.

Structure of the group

Director
J.P. Kimmins (ecosystem ecologist)
Core
P. Burton (regeneration ecologist)
E. Camm (biochemist)
C. Chanway (ecophysiologist)
R. Guy (physiologist)
Affiliate
A. Glass (botanist)
K. Klinka (classification/autecology)
D. Lavender (silviculturalist/physiologist)
G. Weetman (silviculturalist)
J. Worrall (geneticist/dendrologist/physiologist)
INFORMS Director
S. Watts

The anticipated products of WESTFORR are scientific, professional and technical publications; well educated and trained graduate students suitable for careers in resource management research and teaching; computer based research tools for use in ecological succession and regeneration research; and decision support tools for management and policy development applications.

• • • •

B.C. MINISTRY OF FORESTS HIRES TECHNICAL ADVISOR - FOREST VEGETATION MANAGEMENT RESEARCH

Some comments from Phil Comeau, Technical Advisor - Vegetation Management Research.

Forest vegetation management research must deal with a broad range of issues. Research is required in the development and refinement of techniques for vegetation control, in the refinement of techniques for assessing free-growing status of crop tree seedlings, in the development of techniques for predicting vegetation management needs prior to harvesting, and in the assessment of impacts of vegetation management activities. A coordinated program of research is required to provide results applicable to the diverse range of environments and vegetation communities which exist in B.C.

Researchers are making substantial progress in many of these areas at several locations in B.C. However, since most of this research has only been started recently and since the number of researchers is limited, final results and tested applications are not broadly available.

In early 1988 the Ministry of Forests Research Branch employed me (Phil Comeau) as Technical Advisor - Forest Vegetation Management Research. Over the past several months I have had an opportunity to visit several research projects and have been impressed by the work which is currently underway.

As Technical Advisor - Forest Vegetation Management Research my activities are focussing on:

1. providing assistance to vegetation management researchers in the establishment and development of research projects;
2. review and monitoring of vegetation management research activities;
3. identification of vegetation management research needs and priorities; and
4. assisting in the synthesis and presentation of available research information.

I will be working closely with other agencies and organizations in the development of a strategy for vegetation management research in B.C., in the coordination of vegetation management research, in the development of standardized methods for vegetation management research, and in the development of cooperative research projects.

My current activities also include research on the effects of competition from mixed shrub communities on growth and survival of Engelmann spruce seedlings (FRDA Project 3.48), the development of a database and summary of research on vegetation control techniques, and participation in development of a short course on Forest Vegetation Management being prepared with support of the FRDA program.

I welcome comments and suggestions on research needs in vegetation management and would be pleased to provide assistance in the development of vegetation management research projects.

Contact: Phil Comeau, Ministry of Forests, Research Branch, 31, Bastion Square, Victoria, B.C. V8W 3E7
Phone: (604) 387-3019

• • • •

RESEARCH HIGHLIGHTS

MYCOHERBICIDES IN FOREST WEED CONTROL

The Pacific Forestry Centre's activities in biological weed control

The Pacific Forestry Centre (PFC) has accepted mutual responsibility with the British Columbia Ministry of Forests (MOF) to resolve the problem of NSR (Not Satisfactorily Restocked) forest lands. Competing non-crop vegetation provides a constraint both to forest tree seedling establishment and (particularly) to seedling and tree survival thereafter. The PFC has taken a proactive position by establishment of Studies 62.04 & 62.05 (Biological Control of Forest Weeds) under Project 62 (Forest Weed Control Strategies), headed by G.W. Coombs. These studies are staffed by the author, C.E. Dorworth, who performs research on Vancouver Island and in the Northern Interior Region of B.C., and by R.E. Wall, who works on Vancouver Island and in the Southern Interior Region. The PFC Forest Insect and Disease Survey (FIDS), including our Mycologist Dr. Alvin Funk, provides essential scientific information and collections and Mr. T.A.D. Woods serves as Senior Biocontrol Technician for the project.

Changes in forest management parallel to some extent those in agriculture. Nontillage-direct seeding in agriculture is gaining support, as is MSD (Minimal Site Disturbance) planting in forestry. In practice, however, MSD often requires use of fire, chemical herbicides or other silvicultural treatments to constrain weed growth. The biological control option is potentially a superb tool whereby competing non-crop vegetation might be constrained and yet retained on-site as part of the developing forest ecosystem.

Two biological control strategies have been employed in agriculture over the years. The CLASSICAL option involves establishment of a bioagent, either indigenous or exotic, on the target host plant population. The host plants serve as a food base for development, reproduction and perpetuation of the bioagent, thereby assuring continuing constraint of weed growth. The INNUNDATIVE approach is often associated with a single massive application of a bioagent in order to achieve at least one-time control of the targeted plant. The PFC has adopted ENHANCEMENT as a primary method wherein an indigenous candidate biocontrol agent is promoted in vigour and consequently in apparent virulence through inoculation with nutritional, growth-stimulating and/or otherwise beneficial adjuvants in order to promote growth and perhaps reproduction of the bioagent within a delimited geographic area. Simultaneously, attempts are made to precondition or predispose the target plant to infection and colonization by the bioagent through chemical or physical disturbance of plant tissues or by any other environmentally acceptable device that places the host plant at a disadvantage in the resultant pathogenic interaction. The progress of this study can be judged in due course by the results achieved.

The protocol developed is similar to that utilized in most biological control operations:

1. *Identify crop plant/non-crop vegetation competition situations and characterize the general mode of weed interference.* This involves collation of information gained from discussion and observation with respect to each region and forest type, by perusal of the literature and through field observations.

2. *Collect diseased plants, identify causal agents, isolate same in laboratory culture and achieve stable culture storage.* This involves survey and collection by the researcher, by collaborators, and by cooperators such as the MOF, private company foresters and pest managers and by personnel of the PFC-FIDS.

3. *Inoculate stock plants with indigenous candidate bioagents and verify pathogenicity by reproducing the initially observed disease syndrome. Thereafter, use promising pathogens to perform graded inoculation series and quantify virulence.*

4. *Inoculate various additional crop and non-crop plants to verify the specificity of the bioagent.* These measures are begun as soon as testing reveals that a microorganism may have promise as a bioagent. Further, tests with vertebrates and invertebrates are to be incorporated early-on to meet the requirements of pesticide-biocide regulations. These tests are performed with intact plants and animals and with tissue cultures, as appropriate.

5. *Promising candidate bioagents are applied to plants in large experimental design under field conditions to verify utility of the bioagent at operational levels.* This may involve forest replant operations, roadside vegetation management situations, powerline vegetation or other possibilities.

6. *Appropriate bioagents are entered into final stages of patent procedures in cooperation with a potential marketing agent.* This stage of development will have been initiated earlier but is entered into the stream of procedures at this stage.

7. *Ultimately, when at least adequate target species growth restraint is achieved with an appropriate number of weed species, an open-end weed/bioagent interlocking grid is to be programmed for B.C.* Thereby, problem characteristics such as target species and associates, soil type, aspect, geographical location, micro- and macroclimate or, where appropriate, B.C. Forest Type, are entered in and appropriate bioagent plus application and host predisposition methods are gained as response. Eventually, such a program might be integrated with the total B.C. forest management program or entered when desirable as a module or module set and the entire package could thereafter become part of a national program.

Research and development of the type noted above will become subject to increasingly stringent government regulation within the next few years. Consequently, tests and documentation of types yet to be defined will soon be required prior to field testing of a candidate bioagent.

Item 7 in particular may be slightly optimistic at this stage. Any device intended to ensure better forest management must eventually be cost-effective to achieve general acceptance in the forest industry and must consider amenity values as well to gain citizens' acceptance.

The use of imported or exotic pathogens is generally recognized as a more efficient way to control weeds than is possible through use of indigenous microorganisms. The continental forest is comprised of diverse host populations. It is not possible to accurately predict the effects of a newly imported candidate bioagent in the total forest. Species that are presently regarded as weeds, such as *Alnus rubra* and *Populus tremuloides*, could assume significant values within a single growth cycle. The PFC Weed Control project accepts the premise that the risk of significant adverse forest impact does not justify the application of exotic microorganisms in the forest.

Contact: Charles E. Dorworth, Pacific Forestry Centre, Forestry Canada, 506 West Burnside Road, Victoria, B.C. V8Z 1M5 Phone: (604) 388-0600

.....

THE IMPACT OF FOREST HERBICIDE USE ON SMALL MAMMAL POPULATIONS IN THE SBS

An update on FRDA project #1.34

Background and objectives

Herbicide use has accelerated in recent years and this increase is expected to continue. Several species of small mammals utilize areas that are designated for herbicide treatment. These small mammals are important prey for fur bearers and raptors. Habitat alteration could result in changes to small mammal abundance and diversity. Specific objectives of this project are as follows:

1. to measure population levels and species diversity of small mammals in wetter subzones of SBS;
2. to determine the impact of herbicide, glyphosate, on the habitat of small mammals in these subzones; and
3. to assess the impact of glyphosate on small mammal population levels and species diversity.

Accomplishments

A total of 7 sampling periods have been conducted on the small mammal population grids in the SBS_f and SBS_j study areas on TFL 30. All species of small mammals declined over the winter of 1987-88. There was no difference in the magnitude of this decline between the control or treatment sampling areas. Low numbers of mice and voles have been captured throughout the summer on all grids. Slight seasonal increases in abundance of some species has occurred in September and will likely continue into October. Again, no dramatic differences between control and treatment areas have been recorded.

Vegetation sampling on all study areas was completed in August. This sampling period represents the first post-treatment year of vegetation response to the herbicide application.

Contact: Tom Sullivan, Mammal Pest Management Ltd.,23523 47th Avenue, RR#7, Langley, B.C. V3A 4R1
FRDA project #1.34

.....

USE OF HABITAT ALTERATION AND ENCAPSULATED BIOLOGICAL REPELLENTS TO PROTECT CONIFEROUS PLANTATIONS FROM SNOWSHOE HARES

An update on FRDA project #1.46

Background and objectives

The snowshoe hare (*Lepus americanus*) is widely distributed across the boreal and sub-boreal forests of North America. This rabbit fluctuates dramatically in abundance with peak populations occurring every 9-10 years. During a period of high numbers, hares feed intensively on deciduous and coniferous shrub and tree species. Coniferous seedlings which have been planted in recently logged and under-stocked (backlog) areas are particularly vulnerable to feeding damage by snowshow hares. This damage has been reported in both white spruce and lodgepole pine plantations near Prince George. The hare population is currently increasing towards a peak in 1989-1990 in central and northern B.C. The objectives of this project are as follows:

1. to assess the influence of habitat alteration (glyphosate herbicide) on snowshoe hare populations and damage to coniferous seedlings;
2. to field test repellent systems for long-term efficacy and durability in the forest plantation environment; and
3. to modify repellent systems for operational use via both manual and aerial field application.

Accomplishments

Four sampling areas have been established at Caine Creek and Chief Lake northwest of Prince George. The Caine Creek area has control and treatment (glyphosate in August 1988) sampling grids for snowshoe hares and vegetation monitoring. The objective of the herbicide treatment was conifer release. Hare populations, vegetation change, and damage to crop trees will be monitored for the next three years through the 1990 peak in hare abundance. The Chief Lake area also has control and treatment sampling grids for assessing hare populations and vegetation response to conversion of backlog site (mechanical scarification followed by herbicide treatment). Treatment is scheduled for 1989 with planting of seedlings in 1990. Again, these sampling areas will be monitored through the hare cycle, with particular attention given to the effect of the treatment on reducing feeding damage to seedlings by hares.

Encapsulated predator odour repellents will be installed on trees in young plantations at Shelley and near Nukko Lake. Both synthetic weasel and red fox odours will be tested as well as a plant antifeedant. The experiment will commence in early October and August with synthesis and encapsulation of compounds completed by the end of September.

Contact: Tom Sullivan, Mammal Pest Management Ltd., 23523 47th Avenue, RR#7, Langley, B.C. V3A 4R1
FRDA project #1.46

.....

FACTORS AFFECTING THE ESTABLISHMENT AND EARLY GROWTH OF INTERIOR SPRUCE AND LODGEPOLE PINE PLANTATIONS

Highlights of research underway in the interior of British Columbia

Background

Silvicultural treatments during the establishment phase are designed to create plantations that reach the 'free-growing' point cost effectively and at an early age. In the Sub-boreal Spruce zone of interior British Columbia it has been hypothesized that both cold soils due to deep surface organic layers and the rapid development of competing vegetation limit successful plantation establishment. Further, treatments such as scarification, that improve soil temperature conditions, may create nutrient limitations. While many silvicultural trials have been carried out to determine the effectiveness of specific silvicultural treatments, there remains a basic lack of understanding of the relative importance of soil temperature, brush competition, and nutrient availability to early growth of conifers.

Experimental design

An experimental plantation designed to study the relative importance of these three factors was established in May 1986, on TFL 30 (Northwood Pulp and Timber Ltd.), near Prince George. The experiment uses 20 x 40 m plots treated to create differing levels of soil temperature (level 0, organic layers left intact, level 1, scarification, level 2 scarification and application of clear plastic mulch sheets around planted trees), brush competition (level 0, no treatment of competing vegetation, level 1, annual application of Vision herbicide), and nutrient availability (level 0, no fertilization, level 1, annual application of

Osmocote slow release fertilizer around planted trees). Each plot is planted with 100 each of interior spruce and lodgepole pine. The entire experiment is replicated 4 times, with one replicate instrumented to quantify treatment effects on soil temperature, soil moisture tension, light intensity at tree level, air temperature, and relative humidity. Three trees per species per plot are harvest sampled annually for foliar nutrient analysis, foliar and fine root sugar and starch concentration, morphology, component biomass, and growth measures.

Initial results

Harvest sampling has been carried out after the first and second growing season on this site and analysis completed on first season growth, morphology, and biochemistry of planted trees as related to changes in environment. Results indicate that both scarification and scarification with mulching significantly increase available energy in the root zone (i.e. soil temperature) and the availability of light, brush control significantly increases the availability of nutrients and light to the planted trees, and fertilization increases the availability of nutrients to the planted trees. Owing to a heavy snow pack and adequately distributed summer precipitation, moisture is freely available in all plots irrespective of treatment.

Growth response has followed these changes in environmental conditions. Brush competition problems are of primary importance on these sites, and without brush control or scarification, trees of both species suffered heavy mortality and negligible growth. The second most important factor is soil temperature, with scarification and mulching causing a doubling of growth rate relative to unprepared plots. Fertilization was ineffective on plots without brush control, but in combination with soil temperature improvements and brush control, resulted in approximately 50% improvement in growth rate for both species. Using a modified technique of agricultural growth analysis, treatment responses can be subdivided into components of resource availability, resource use efficiency, and acclimatization by the trees. A three part series of publications is currently being prepared that will examine these changes in environment, plant development and growth.

Contact: David G. Brand, Forestry Canada, Petawawa National Forestry Institute, Chalk River, Ontario K0J 1J0

.....

GEL CAP DEMONSTRATION TRIAL

An update on FRDA (Direct Delivery) project #F-52-42-102

A field demonstration of the Gel Cap herbicide capsule injection system was held at the Malcomb Knapp UBC Research Forest on September 21st 1988. The demonstration was hosted by Bill Martin of Pace Chemicals and John Bartlett a consulting forester.

History of the capsule's development

BC Hydro Research and Development started developing a herbicide capsule injection system in 1982. Co-funding from the Canadian Electrical Association in 1985 prompted further research trials across Canada. Since 1987 commercial marketing of the capsule system has been under the control of Pace Chemicals Ltd.

Description of the capsule injection system

Gel Cap is an open-ended capsule (2 cm long and 1.5 cm diameter) with sharp leading edges on the outer ring and inner post. The capsule is applied to a tree using a specially designed socket fitted to a battery powered drill. On application to a tree these edges penetrate the bark and are pulled into the cambium layer by a centrally located screw. This contact between living tissue and the encapsulated herbicide initiates translocation of the herbicide throughout the tree.

Project test sites

Each test location (there are four in BC under this project) consists of paired plots comparing the Gel Cap system with hack and squirt operations. Five replicates have been established at each location. It is hoped that results will allow comparisons of costs, productivity and efficacy of the two techniques.

At the UBC Research Forest test site both treatments were applied in April 1988. First and second growing season treatment results are being recorded using a condensed version of a BC Hydro classification system referred to as the "foliar index scale". This scale ranges from 0-9, with 0 being perfectly healthy trees and 9 being completely dead and defoliated trees. At the time of this demonstration, the trees treated by the Gel Cap system were showing sufficient symptoms that they were predicted to die (bark darkening and leaf damage in the upper branches), and corresponding to a foliar index scale of 6-8, mostly 6. The hack and squirt trees were completely dead and defoliated or appeared dead but were not completely defoliated, corresponding to a foliar index scale of 8-9.

Application rates

To date capsules used in all trials have contained 1mL of Vision (Monsanto Canada Inc.) herbicide in a gel formulation. The application rate used at the four test sites has been one capsule per tree under 6cm dbh and 2 capsules for trees 6-10 cm dbh. Some of the test trees at the UBC Research Forest site are 25-30 cm dbh and considered to be larger than ideal for this technique. An identical herbicide application rate was used in the hack and squirt operations at each test site.

Potential uses of the Gel Cap system

Discussion of potential applications of the Gel Cap system focussed on aspects of its selectivity and slow kill rate such as may be advantageous in politically sensitive areas, streamside use, fire breaks, wildlife habitat control, and areas where crop trees may be prone to sunscorch.

Further details of the Gel Cap herbicide capsule injection system and details of future demonstration dates can be obtained from Pace Chemicals. Demonstrations at any of the four sites (UBC Research Forest, Prince George, southern Interior and Vancouver Island) can also be arranged by special request.

Contact: Bill Martin - Pace Chemicals Ltd., 8321 Willard Street, Burnaby, B.C. V3N 2X3 Phone: (604) 520-6211
FRDA project #F-52-42-102

.....

VM DEMONSTRATION PROJECTS AT THE UBC RESEARCH FOREST

An update on FRDA project #2.50

The main VM demonstration area was initiated in 1986 on an easily accessible, previously cleared, site at the UBC Research Forest in Maple Ridge. Demonstration is being made of the effects of various types of non-crop vegetation on the growth and survival of conifer crop seedlings, and the success of various measures to overcome competitive effects from non-crop vegetation. Eight 20 x 25m plots were established and planted with Douglas-fir, western hemlock and western red cedar in the spring of 1987. Heavy deer browse damage to the cedar and Douglas-fir in the following winter has necessitated some replanting, which was done with Douglas-fir. In the spring of 1988 one of eight treatments was assigned to each plot:

- control, no vegetation removed;
- complete vegetation removal;
- removal of all vegetation but leaving red alder; and
- removal of all deciduous trees, leaving shrubs and herbs.

Four more treatments were created by adding slow release fertilizer to the crop seedlings in each of the above prescriptions.

Measurements are being taken of annual patterns of survival, height of conifer seedlings and the height, leaf-area and biomass accumulation of the non-crop vegetation under various treatments. Comparisons are being made of light conditions within the different vegetation types and treatments. Measurements of photosynthesis and stomatal conductance will be used to investigate the physiology of seedlings growing within the different environments imposed.

Two-metre wide trails have been established between the plots which it is hoped will provide demonstration for the next 10 years. Information boards will be erected at the site in the spring of 1989.

As a separate project, a small scale western red cedar/red alder and western red cedar/birch experiment has been established close to this main demonstration area. This experiment is looking at seedling growth and physiology under an alder canopy. To separate the effects of shading and increased soil nitrogen within the alder stand, the experiment has been replicated in an adjacent birch plantation. Photosynthesis and stomatal conductance of the western red cedar are being monitored.

Contact: John Karakatsoulis, Forest Science Department, Faculty of Forestry, University of B.C., 2357 Main Mall, Vancouver, B.C. V6T 1W5
FRDA project #2.50

.....

NEW ABSTRACTED BIBLIOGRAPHY AND COMPUTERIZED DATA-BASE FOR SEVEN SOUTHERN INTERIOR WEED SPECIES

Highlights of FRDA project #3.41

A bibliography of 395 references relating to the competitive status and autecology of seven southern Interior weed species has recently been prepared under FRDA project #3.41. (Financial support was provided from the Canada - British Columbia Forest Resource

Development Agreement, Extension and Demonstration, Research and Development sub-program.)

The vegetation species covered by this bibliography include Sitka alder, paper birch, pinegrass, fireweed, false azalea, white-flowered rhododendron and thimbleberry.

The abstracted bibliography was prepared in printed form and for use with IBM-PC or compatible microcomputers, using Ashton Tate's data-base management software dBASE III PLUS. References can be searched, displayed, printed and updated using dBASE III PLUS, or with software capable of using dBASE III PLUS files.

A custom designed searching program facilitates easy menu-driven access to records (references). Character strings (words or groups of words) can be searched and located from either the name, date, title, source or keyword field on all records. Abstracts are available for viewing with most records.

The result of any search is displayed immediately on the screen, and if desired, can be stored to a text file or printed directly as a hard copy.

Associated with this data-base is a literature review of the autecological characteristics of each of the seven weed species. This review follows the format of Haeussler and Coates (1986) providing an update, when new literature was found, to their publication.

Distribution procedures for this literature review and data-base have not yet been finalized.

Reference
Haeussler, S., Coates, D. (1986) Autecological characteristics of selected species that compete with conifers in British Columbia: a literature review. Land Manage. Rep. 33. B.C. Min. For. Lands

Contact: Denis Lloyd, MoF, Kamloops Forest Region, or Phil Comeau, MoF, Research Branch, 31 Bastion Square, Victoria, B.C.

• • • •

B.C. VEGETATION MANAGEMENT RESEARCH COMMITTEE

Minutes of the general meeting and subcommittee meetings held at the Richmond Inn, Richmond, B.C., November 18th, 1988

Note: This newsletter (UBC INFORMS) is now serving as the distribution network for minutes of the meetings of the BC Vegetation Management Research Committee.

Subcommittee minutes

SUCCESSION SUBCOMMITTEE

E. Hamilton (chair)

Updates on Research

Summaries of ongoing research and related activities were presented by subcommittee members.

F. Nuszdorfer (Vancouver) - Response to site preparation, alluvial site succession.
C. Sutherland (Cariboo) - Response of vegetation to site preparation (mounding, scalping, grass seeding, herbicides, sheep grazing) - 15 trials.
T. Braumandl (Nelson) - Post fire vegetation development, response to site preparation and grass seeding treatments.
A. Banner (Prince Rupert) - 5 year post burning succession, coastal red alder succession, response to site preparation, stand conversion, SBS seral classification, mapping.
F. Newhouse (Prince Rupert) - Post herbicide response of browse species.
C. DeLong (Prince George) - Post treatment (mounding, herbicides) SBS, aspen succession.
E. Hamilton (Victoria) - Post burning succession in SBS and ESSF.
D. Lloyd (Kamloops, absent) - Post treatment (site preparation, herbicides) succession, ESSF, MS, IDF.
S. von Schuckman (MOE) - Monitoring guidelines
T. Lea (MOE)- Mapping wildlife habitat, forage production.
C. Caza (UBC) - Reported on UBC Forest Sciences Succession Colloquim.
M. Feller (UBC) - Post fire succession.
K. Klinka (UBC) - Successional classification.
F. Bunnell (UBC) - Wildlife values.
H. Kimmins (UBC) - Post site treatment succession.
E. Oswald (For. Can.) - Post wildfire succession Yukon, post site preparation succession in the Nelson Region.

A system for summarizing ongoing succession related research projects will be developed. A summary of national research projects prepared by E. Oswald will be circulated for review to determine if this format would be appropriate. Other existing systems include the FRDA project tracking system and the Research Branch Research Management Information System (FMIS).

Development of predictive models and expert systems
A demonstration of an expert system for predicting vegetation response to slash burning will be set up for evaluation at the next succession subcommittee meeting scheduled for March 6 1989.

Successional Classification Framework
The members of the subcommittee will review the classification framework outlined in "A System for the Classification of Seral Ecosystems within the Biogeoclimatic Ecosystem Classification - First Approximation" by E. Hamilton (1988), and provide comments to the author by March 1 1989.

Standardization of Data Collection Methodologies
A format for collection of data on vegetation change has been developed by the Ministry of Environment and Ministry of Forests. The procedure is outlined in "Procedures for Environmental Monitoring in Range and Wildlife Habitat Management". Review of the procedures has been requested by March 1 1989. Please forward comments to E. Hamilton in advance of this date.

Subcommittee contact: E. Hamilton, MoF, Research Branch, Victoria.
Phone: (604) 387-3650

AUTECOLOGY SUBCOMMITTEE
A. MacKinnon (chair)

Updates on Research
Updates on ongoing autecology research were provided. *D. Crampton* - aspen and spruce; *C. Delong* - SBS mixed shrub components; *C. Messier* - salal resource allocation; *A. McGee* - red alder seedling recruitment; *K. Yearsley, E. Hamilton* - SBS mixed shrub components; *B. Bancroft* - alder (seed trees), aspen viability of seeds; *A. Nicholson* - fireweed, pinegrass; *G. Porter* - willows; *E. Oswald* - false azalea rhododendron reproduction; *R. Mason* - thimbleberry, Devil's club; *F. Bunnell* - salal and Vaccinium; *G. Weetman* - salal; *F. Newhouse* - wildlife browse species (R. Pojar); *C. Messier* - salal.

Subcommittee members were asked to provide recommendations on information to be included in a proposed revision to the Autecology Handbook - Land Management Handbook No. 9 by D. Coates and S. Haeussler 1986. Questions to be addressed include 1) new species to be added, 2) level of detail of information on response to treatment and 3) information on wildlife values. The need for information on pre-harvest control of aspen and alder seed regeneration was identified by some subcommittee members. Please send comments to Evelyn Hamilton.

Subcommittee contact: A. MacKinnon, MoF, Research Branch, Victoria.
Phone: (604) 387-6536

COMPETITION SUBCOMMITTEE
C. Delong (chair)

Updates on Research
C. DeLong provided an update of ongoing research on competition in different vegetation complexes.

Standardization
A standardized format for data collection for vegetation competition studies and a format for summarizing information on the response of vegetation complexes to treatments are being circulated for review. Comments should be forwarded to the subcommittee chairman by March 1 1989.

Free growing standards
Subcommittee members were asked to make preliminary recommendations regarding the application of current free growing standards in the various vegetation complexes. One approach might be to rate from 1 (low) to 5 (high) the level of competition for light, moisture and nutrients likely to be found in these complexes when the vegetation forms a continuous cover at a) ground level, b) equal to the average height of the seedling, or c) overtopping the seedling by 20 cm. Comments on this or other approaches are requested.

Subcommittee contact: C. DeLong, MoF, Prince George Forest Region.
Phone: (604) 565-6133

VEGETATION CONTROL - ECW SUBCOMMITTEE
J. Pollack (chair)

Review of progress
Progress in several areas was summarized, namely:

Screening trials in Western Canada (ECW) - Herbicide screening studies are reported annually as abstracts in the Research Report, Volume 3, of the Expert Committee on Weeds/Western Section. In 1988 thirty one such abstracts were presented from B.C.
Herbicide efficacy review - Recent work by P. Balfour examines a wide variety of target species of value to wildlife, and provides a summary of efficacy data. This publication is under review and it is hoped that it will be available as a FRDA report by the end of March 1989. Planned computerization of Volume 3 of the ECW research report is expected to be completed in 1990. It is recommended that the Committee consider supporting the retrospective computerization of earlier abstracts.
Research applicators course - Two Smithers-based courses were held in 1987. Repeats in Nelson in 1989 will be available.

Subcommittee contact: J. Pollack, MoF, Nelson Forest Region.
Phone: (604) 354-6274

ENVIRONMENTAL MONITORING SUBCOMMITTEE

D. Spittlehouse (chair)

Membership and mandate
Additional membership was invited, either formally or informally. The purpose of the committee was outlined as one offering advice on interpretation of environmental data in relation to vegetation management research, and application of environmental data in operational situations.

Climate data - quality control, archiving and analysis
A need was expressed for procedures to guide quality control in the field (sensor location and reliability), edit the data, archive the data for use by others, and analyse the data. A FRDA project proposal is being circulated which outlines guidelines for the storage and analysis of environmental data and which would include the production of a catalogue of all environmental data collected by FRDA.

Identification of sites for long-term monitoring
These sites would provide climate information for ecosystems for which we have little information. Equipment is available to allow monitoring of remote sites with a minimal number of site visits each year.

Identification of areas requiring monitoring
Ecosystems for which we have no climate information should be identified and a monitoring program established where possible.

Fire weather network
Protection Branch has a number of stations installed which provide hourly temperature and precipitation data on a near real-time basis. Recommendations should be made as to possible locations of these sites in areas of interest to this group.

Subcommittee contact: D. Spittlehouse, MoF, Research Branch, Victoria.
Phone: (604) 387-3453

General meeting minutes

GENERAL MEETING

C. DeLong (chair)

Updates on Committee activities
A Technical Coordination Committee, to be chaired by P.Comeau and A. MacKinnon, was established. A formative meeting of this committee was held on November 17th 1988, at Richmond, B.C. Representatives from MoF, IVMA, MoE, NSC, FORCAN and UBC were present.

Terms of Reference
Committee members were asked to review the revised terms of reference and to be prepared to vote on the adoption of these terms at the next general meeting.

Interpretations Working Group
G. Still reported on the structure and activities of the Interpretations Working Group. A motion to establish official liaison with the IWG was passed.

FRDA E and D
P. Comeau reported briefly on FRDA vegetation management E and D activities. A vegetation management course is being developed by P. Comeau, C. Pierce (consultant) and J. Karakatsoulis (UBC).

November 1989 Technical Session
The next technical session is scheduled for November 15 and 16 1989 in Vancouver. Committee members are asked to forward comments regarding suggested format and contents of the next technical session to the Committee chairman (E. Hamilton) by March 1 1989 (in advance of the first technical session organizing committee meeting

scheduled for March 6 1989). The organizing committee will include a representatives from each subcommittee.

Upcoming Subcommittee Meetings
The Autecology, Competition and Succession Subcommittes will meet on Monday March 6 at 1pm at the UBC Graduate Student Centre (Patio Room) on UBC campus. Contact E. Hamilton for further details (387-3650).

Election of Officers
Elections of the following new officers were made:
Evelyn Hamilton (MoF Research Branch, Victoria) - *chair*
Phil Comeau (MoF Research Branch, Victoria) - *vice chair*
Sue Watts (UBC Forest Science Department) - *secretary / treasurer*

• • • •

UPCOMING MEETINGS

Integrated Vegetation Management Association - Annual Meeting January 25-26, 1989, Richmond Inn, Richmond, BC. The theme for this meeting is new techniques in vegetation management.
Contact: Bill Martin 520-6211

Forest Vegetation Management Workshop January 31 - February 2, 1989, Oregon State University, Corvallis, Oregon. A two or three day workshop looking at tools for assessing the impact of competing vegetation, and interactions of vegetation management with wildlife and long-term productivity. Registration is US$135 for two days and $170 for the full three days.
Contact: Conference Assistant, College of Forestry, Oregon State University, Peavy Hall 140, Corvallis, Oregon 97331-5710. Phone: (503) 754-2004

Coastal Silviculture Committee - Winter Workshop February 7-8, 1989, Coast Bastion Hotel, Nanaimo, BC. A vegetation management section is scheduled which will include an update on herbicide research.
Contacts: Dan Lousier 390-4566; Frank Barber 387-3910; Bob Jones 658-8745

Southern Interior Silviculture Committee - Winter Workshop March 13-15, 1989, Delta Lakeside Hotel, Penticton, BC. The theme of this workshop is integrated use in the Montane Spruce Zone.
Contact: Phil Youwe 828-4097

On March 13th, in the afternoon, and in conjunction with the above meeting, Southern Interior FRDA is organizing a half-day seminar covering ICH research results.
Contact : Cindy Pearce 732-6169

Southern Interior FRDA Workshop Location and content to be confirmed. This workshop will address the rehabilitation of high elevation brush fields.
Contact: Cindy Pearce 732-6169

Coastal Silviculture Committee - Summer Workshop June 19-21, 1989, Vedder Mountain and Chilliwack valley. Vegetation management is scheduled to play a significant part in this summer field tour.
Contacts: Dan Lousier 390-4566; Bob Jones 658-8745

Southern Interior Silviculture Committee - Summer Workshop August 8-10, 1989, Merritt, BC. Focus will be highlights of winter workshop topics.
Contact: Phil Youwe 828-4097

BC Vegetation Management Research Committee - Annual Workshop November 15-16, 1989, Vancouver, BC. Further details will be announced in the next issue of this newsletter.

• • • •

PROCEEDINGS OF RECENT VM MEETINGS - NOW AVAILABLE

VEGETATION COMPETITION AND RESPONSES: PROCEEDINGS OF THE THIRD ANNUAL WORKSHOP

FRDA Report #026 May 1988 (85 pages)

The proceedings of this workshop, held in Vancouver on February 15-17, 1988, have been published and are now available as a FRDA report. Over 150 people attended the workshop, which featured oral presentations, poster presentations and four special workshop sessions. The objective of the workshop was to facilitate discussion of current research in vegetation management, with a focus on vegetation competition and responses. The proceedings provide summaries of the sixteen papers and fourteen

posters that were presented as well as summaries of the four special workshop sessions.

Copies of this report can be obtained (free of charge) from the following address:

Ministry of Forests
Research Branch
31, Bastion Square
Victoria, B.C.
V8W 3E7

THE HERBICIDE ISSUES SEMINAR: A SUMMARY OF PROCEEDINGS

Monsanto Canada Inc. 1988 (165 pages)

The proceedings of this seminar, held in Richmond on June 28-29, 1988, have now been published by Monsanto Canada Inc., the sponsoring body. Eighteen presented papers are summarized in the report. Topics covered by the presentations include human safety, regulation, environmental safety, herbicide use in BC, perceptions of herbicides and products for the future. All participants in this seminar have already received their copies of the proceedings. Additional copies can be ordered for $15.00 (to cover photocopying and postage) from the following address:

Monsanto Canada Inc.
Box 1159
Delta, B.C.
V4M 3T2
Phone: (604) 943-0119

• • • •

SOME RECENT VM PUBLICATIONS

HERBICIDE USE IN FORESTRY: COMMUNICATION AND INFORMATION GAPS

Ann B. McGee and Edwin Levy

A summary of a recent paper published in the Journal of Environmental Management (1988) 26, 111-126

This paper examines the communication and information gaps in the controversy of herbicide use in forest management and some features of the relationships between science, politics and philosophy that underlie these disputes. The communication gap is examined with respect to the way the two sides perceive and portray one another. Information and information gaps are discussed in terms of possible methods of vegetation control, and possible impacts of herbicide use on human health and the environment.

STANDARD PRACTICES FOR PESTICIDE APPLICATORS
A Manual of Health Information and Safe Practices for Workers Who Apply Pesticides

The Workers' Compensation Board of British Columbia

A summary of the Workers' Compensation Board Manual, now in its seventh printing, March 1988 (221 pages)

This manual deals specifically with the health and safety aspects of pesticide use. Topics covered range from legislation, pesticide types, routes of entry, toxicity and poisoning, hazard evaluation, handling and application precautions, emergency procedures and record keeping. The manual is suggested for use along with the B.C. Ministry of Environment's Handbook for Pesticide Applicators and Pesticide Dispensers which provides information on the selection of pesticides and application systems. The 1988 edition of the WCB Manual is available at no cost from the following address:

Films and Poster Department
Workers' Compensation Board
6951 Westminster Highway
Richmond, B.C.
V7C 1C6
Phone: (604) 273-2266

PESTICIDE REGULATION IN BRITISH COLUMBIA

The Ombudsman of British Columbia

A summary of the Ombudsman's Public Report #11, March 1988 (74 pages)

This report was commenced on the Ombudsman's initiative as a result of complaints received concerning pesticide regulation in B.C. It is presented as a systems study which makes recommendations for the timely and meaningful participation by all interested parties in

pesticide use decisions. The recommendations address the issues of timely public notice and consultation, public access to accurate information, comprehensive analysis of alternative measures, and procedural fairness in the appeal process. The report is available at no cost from the following address:

The Ombudsman's Office
8, Bastion Square
Victoria, B.C.
V8W 1H9
Phone: (604) 387-5855

• • • •

A SUMMARY OF NEWSLETTERS AND ASSOCIATIONS OF INTEREST TO VEGETATION MANAGERS

Screef: Eye on the silviculture industry

(newsletter of the Pacific Reforestation Workers Association)

The Pacific Reforestation Workers Association is a registered non-profit society of British Columbia. It exists to serve the interests of silviculture workers, especially tree planters, spacers and brushing and weeding workers.

Screef, the quarterly newsletter of this association is available by subscription at a cost of $12.00 /year. For further details on membership in this association, or for enquiries regarding subscriptions to Screef magazine, contact:

The Pacific Reforestation Workers Association
P.O. Box 3352
Vancouver Main Post Office
Vancouver, B.C.
V6B 3Y3
Phone: (604) 681-5295

WSCA Newsletter

(newsletter of the Western Silviculture Contractors Association)

WSCA is an organization dedicated to furthering the interests of silviculture contractors.
The WSCA newsletter is produced four times a year and can be obtained by subscription at a cost of $25 /year. For further details on membership in this association, or for newsletter subscription information, contact:

Western Silviculture Contractors Association
#310 - 1070 West Broadway
Vancouver, B.C.
V6H 1E7
Phone: (604) 736-8660

IVMA Newsletter

(newsletter of the Integrated Vegetation Management Association of British Columbia)

The Integrated Vegetation Management Association of BC was founded in 1982 to provide a forum in which members can actively promote the use of optimum practices, procedures and standards within the field of vegetation management. A quarterly newsletter is available to members of the association. For further details on membership ($40 /year), contact:

Larry Taylor
Monsanto Canada Inc.
P.O. Box 1159
Delta, B.C.
V4M 3T2
Phone: (604) 943-0119

Solutions - the FRDA Research Newsletter

Solutions is the newsletter of the **FRDA (Forest Resource Development Agreement) research program** and is jointly sponsored by Forestry Canada and the BC Ministry of Forests. The newsletter features articles and updates from the direct delivery and shareable components of FRDA research. It is produced twice a year and can be obtained free-of-charge, contact:

B.C. Ministry of Forests
Research Branch
31 Bastion Square
Victoria, B.C.
V8W 3E7
Phone: (604) 387-6719

CRAFTS - Annual Report

(Forest Research Laboratory, Oregon State University, Corvallis, Oregon, USA)

The CRAFTS **(Coordinated Research on Alternative Forestry Treatments and Systems)** program at OSU was

established in 1980. The purpose of the program is to provide leadership and direction within the discipline of vegetation management. The cooperative also provides information to its members and others about such management in the Pacific Northwest. Cooperators in the program include US forestry companies and government agencies. Canadian representation is provided by MacMillan Bloedel and the BC Ministry of Forests. The CRAFTS Annual Report is available without charge to any interested individuals, contact:

Bob Wagner
CRAFTS
Forest Science Department
Oregon State University
Peavy Hall 154
Corvallis, Oregon 97331-5705
USA
Phone: (503) 754-2244

The Bottom Line
(A newsletter from Dow Chemical Corporation)

This newsletter deals mostly with pesticides and public issues concerning the agro-chemical industry. However, articles on forestry / herbicide issues are often included. The Bottom Line is produced three times a year and is free-of-charge. For further subscription information, contact:

Mazie B. Sowles
The Bottom Line
P.O. Box 1706
Midland, Michigan 48641-1706
USA
Phone: (517) 636-1020

Silviscope - News and information for forest managers
(A newsletter from Monsanto Canada)

Silviscope is a new newsletter aimed at foresters and aerial applicators. It was launched by the Monsanto Company this past summer. Future editions of this newsletter will cover a wide range of topics affecting the industry, including highlights of successful vegetation management programs, proper herbicide techniques and news and information on Monsanto products. Monsanto plans to publish Silviscope quarterly. For further subscription information (it is free so far), contact:

Silviscope
Monsanto Company
55 Murray Park Road
Winnipeg, Manitoba
R3J 3W2

Silvicultural Operations Newsletter
(A newsletter from Forest Engineering Research Institute of Canada)

The Silvicultural Operations newsletter is produced by the silvicultural operations group of the Forest and Engineering Institute of Canada (FERIC). This new newsletter supercedes the Mechanization of Silviculture Newsletter which had previously been the responsibility of the Great Lakes Forestry Centre. The purpose of this new newsletter is to increase the awareness of new methods and techniques from across the country, and to promote information transfer through communication between forest managers, researchers and field practitioners. For further subscription information (the newsletter is free-of-charge), contact:

Luc Desrochers
Silvicultural Operations Newsletter
FERIC
143 Place Frontenac
Pointe Claire, Quebec
H9R 4Z7
Phone: (514) 694-1140

Publication listings

Queen's Printer Publication Listing

Crown Publications, the private sector distributor of Queen's Printer Publications, maintains an annual catalogue (and price list) of currently available Ministry publications, Acts, Regulations *etc*. A new 1989 catalogue will be available from mid-January, and can be obtained free-of-charge from the following address:

Crown Publications
546 Yates Street
Victoria, B.C.
V8W 1K8
(604) 386-4636

FRDA Report Listing

Listings of FRDA reports (all free-of-charge while supplies last) can be obtained from Forestry Canada at the following address:

Forestry Canada
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C.
V8Z 1M5
Phone: (604) 388-0600

• • • •

THE INFORMS BIBLIOGRAPHY AND LIBRARY
An update

The INFORMS bibliography is a computerized data base of published and unpublished vegetation management reference material. Information can be accessed by name, date, title, source, keyword(s), or any combination of these. All material in the data base is also housed in the INFORMS library as a hard copy. The data base is maintained on the UBC main-frame computer and searching can be performed, as requested, by Dr. Sue Watts. A fuil listing of the keywords presently available for searching is included in this newsletter. A recent addition has been the development of a system to download the main-frame data base contents to a dBASEIII PLUS system. This microcomputer format will facilitate independent access and searching of the data by any interested microcomputer users. For more information on this data base transfer, please contact Sue Watts at 228-6316.

MAILING LIST ADDITIONS

Effective this issue, the INFORMS newsletter is being published as FRDA document by Forestry Canada. However, individuals can still be added to the mailing list by contacting Sue Watts at UBC. Additional copies of this issue are available from Forestry Canada (see the section headed "INFORMS newsletter circulation" on the first page of this newsletter). This particular issue covers the minutes from the recent business meetings of the BC Vegetation Management Research Committee. It is our intention to include, on the INFORMS mailing list, all those who attended this day of meetings. Please contact Sue Watts at (604) 228-6316 if you are aware of any deficiencies in the distribution of this newsletter. It is our intention to produce the INFORMS newsletter twice a year.

• • • •

Listing of -A at 22:50:25 on DEC 12, 1988 for CCid=RWSW on G

1 AATREX
2 ABCPF
3 ACME 800
4 ADD
5 ADDITION SERIES
6 AERIAL APPLICATION
7 AGROFORESTRY
8 ALACHLOR
9 ALDER
10 ALGAE
11 ALLELOPATHY
12 ALLY
13 AMITROLE
14 AMMONIUM SULPHAMATE
15 AMMONIUM SULPHATE
16 AMPA
17 ANNOTATED BIBLIOGRAPHY
18 ANNUAL GRASS
19 APPLICATION METHODS
20 APPLICATION TEMPERATURE
21 AQUATIC IMPACTS
22 ARSENAL
23 ARSENAL;
24 ASPEN
25 ASSURE
26 ASULAM
27 ASULOX F
28 ATRAZINE
29 AUBURN
30 AUBURN ANNUAL REPORT
31 AUTECOLOGY
32 BACCHARIS
33 BALSAM FIR
34 BALSAM POPLAR
35 BANVEL
36 BASAGRAN
37 BASSWOOD
38 BCFS
39 BCMOF
40 BEAKED HAZEL
41 BEAKED HAZLENUT
42 BEARGRASS
43 BENAZOLIN
44 BERRY FRUITS
45 BERRY PRODUCTON
46 BIBLIOGRAPHY
47 BIFENOX
48 BIG TOOTH ASPEN
49 BIGLEAF MAPLE
50 BIOLOGICAL CONTROLS
51 BIOMASS STUDIES
52 BIOTECHNOLOGY
53 BIRCH
54 BIRD IMPACTS
55 BLACK CHERRY
56 BLACK COTTONWOOD
57 BLACK OAK
58 BLACK SPRUCE
59 BLACK TWINBERRY
60 BLACK WALNUT
61 BLACKBERRY
62 BLUE ELDERBERRY
63 BLUE JOINT
64 BRACKEN
65 BRACKEN FERN
66 BROOMSEDGE
67 BRUSHSAWS
68 BUFFER ZONES
69 CACODYLIC ACID
70 CALIBRATIONS
71 CALLIBRATIONS
72 CANYON LIVE OAK
73 CARAGARD
74 CARIBBEAN PINE
75 CARNATION CREEK
76 CASCARA
77 CASORON
78 CEANOTHUS
79 CFA
80 CFS
81 CHECK
82 CHEMICAL CONTROLS
83 CHERRY
84 CHINKAPIN
85 CHLORTHAL
86 CINCH
87 CINMETHYLIN
88 CLEANING-THINNING
89 CLOPYRLID
90 COBRA
91 COFI
92 COMPETITION
93 COMPETITION INDICES
94 COMPETITION THRESHOLDS
95 CONIFER RELEASE
96 CONTROL COSTS
97 COOPERATIVES
98 COST EFFECTIVENESS ANALYSIS
99 COST/BENEFIT ANALYSIS
100 COST/BENEFIT STUDIES
101 COSTS OF CONTROLS
102 COTTONWOOD
103 CPPA
104 CRAFTS
105 CRANBERRY
106 CROP DAMAGE
107 CROP MORPHOLOGY
108 CROP PHYSIOLOGY
109 CROP RESPONSE
110 CROP STAGNATION
111 CROP/WEED INTERACTIONS
112 DALAPON
113 DAPHNIA
114 DAZOMET
115 DCNA
116 DCPA
117 DECIDUOUS TREE CONTROL
118 DEERBRUSH
119 DEFINING BRUSH PROBLEMS
120 DEMONSTRATION SITES
121 DEVILS CLUB
122 DICAMBA
123 DICHLOBENIL
124 DICHLOROPROP
125 DICLORPROP
126 DIFLUBENZURON
127 DINOSEB
128 DIOXIN
129 DIPHENAMID
130 DOGFENNEL
131 DOUGLAS MAPLE
132 DOUGLAS-FIR
133 DPX-L5300
134 DRIFT
135 DUPONT
136 EASTERN WHITE PINE
137 ECONOMIC BENEFIT ANALYSIS
138 ECW
139 ELDERBERRY
140 ENGELMANN SPRUCE
141 ENIDE
142 ENVIRONMENTAL IMPACTS
143 EPA
144 ESCORT
145 ESTERON
146 ESTERON 99
147 ETHOMEEN C12
148 ETHOMEEN T25
149 EXPERIMENTAL DESIGN
150 EXPRESS
151 EXTENSION
152 F.I.R.
153 FALSE AZALEA
154 FEDERAL LAW
155 FEDERAL POLICY
156 FERTILIZATION
157 FESCUE
158 FIR
159 FIRE
160 FIREWEED
161 FISH RESPONSE
162 FOLIAR N
163 FORAGE IMPACTS
164 FORBS
165 FORCYTE
166 FORESTAMINE GUARDMAN
167 FORESTER ESTERON
168 FORM
169 FORMULATIONS
170 FOSAMINE
171 FOSAMINE AMMONIUM
172 FPMI
173 FRDA
174 FREE-TO-GROW

A Listing of data base keywords in use as of December, 1988.

Listing of -A at 22:50:25 on DEC 12, 1988 for CCid=RWSW on G

175 FURLOE
176 FUSIFORM RUST
177 GAMEL OAK
178 GARLON
179 GARLON 3A
180 GARLON 4
181 GARLON-1
182 GLOSSARY
183 GLYPHOSATE
184 GOAL
185 GOAL 2E
186 GOLDENROD
187 GRAND FIR
188 GRAND PINE
189 GRASS
190 GRASS CONTROL
191 GRASSES
192 GRAZING
193 GREAT BRITAIN
194 GREEN ALDER
195 GREEN ASH
196 GUIDELINES
197 HANDBOOK
198 HANEY
199 HARVESTING PRACTICES
200 HAZARD ASSESSMENT
201 HAZEL
202 HAZLENUT
203 HERBACEOUS WEED CONTROL
204 HERBACEOUS WEEDS
205 HERBICIDE APPLICATION
206 HERBICIDE BREAKDOWN
207 HERBICIDE DAMAGE
208 HERBICIDE EFFICACY
209 HERBICIDE IMPACT STUDIES
210 HERBICIDE ISSUES
211 HERBICIDE MOVEMENT
212 HERBICIDE PROPERTIES
213 HERBICIDE REGISTRATION
214 HERBICIDE REGULATIONS
215 HERBICIDE RESIDUES
216 HERBICIDE SCREENING
217 HERBICIDE SPRAY MONITORING
218 HERBICIDE USE STATISTICS
219 HERBICIDES
220 HERBICIDES ECOLOGICAL EFFECTS
221 HERBICIDES ENVIRONMENTAL IMPACTS
222 HERBICIDES ENVIRONMENTAL PROTECTION
223 HERBICIDES GENERAL
224 HERBICIDES HEALTH RISKS
225 HERBICIDES MOA
226 HERBICIDES REGULATIONS
227 HERBS
228 HERICIDES ENVIRONMENTAL IMPACTS
229 HEXAZINONE
230 HOE-00661
231 HUCKLEBERRY
232 HUMAN EXPOSURE
233 IMAZAPYR
234 INCENSE CEDAR
235 INFORMATION SYSTEMS
236 INTERFERENCE
237 INTERIOR
238 INTERPLANTING
239 INVERTING
240 IPM
241 IUFRO
242 JACK PINE
243 JACKPINE
244 JEFFREY PINE
245 KALMIA
246 KNAPWEED
247 KRENITE
248 LADY FERN
249 LARCH
250 LEGISLATION
251 LIGHT
252 LIGHT RESPONSES
253 LITERATURE SURVEY
254 LOBLOLLY PINE
255 LODGEPOLE PINE
256 LONGLEAF PINE
257 LONTREL
258 MADRONE
259 MANUAL CONTROLS
260 MANZANITA
261 MAPLE
262 MARC WATERSHED
263 MECHANICAL CONTROLS
264 MECOPROP
265 MENZIESIA
266 METALAXYL
267 METHYL BROMIDE
268 METSULFURON
269 MEXACARBAMATE
270 MIXING
271 MM
272 MOA
273 MODELLING
274 MOF
275 MOFL
276 MOISTURE
277 MONSANTO
278 MOUNDING
279 MOUNTAIN ALDER
280 MOUNTAIN ASH
281 MOUNTAIN MAPLE
282 MOUNTAIN WHITETHORN
283 MOWING
284 MSMA
285 MULCHING
286 MYCORRHIZA RESPONSE
287 NACSI
288 NAPROPAMIDE
289 NC-28858
290 NCASI
291 NEIGHBOURHOOD EXPER IMENTS
292 NELDER PLOTS
293 NILS
294 NINEBARK
295 NITROFEN
296 NITROGEN
297 NITROGEN CYCLING
298 NOBLE FIR
299 NON-TARGET IMPACTS
300 NORWAY
301 NORWAY SPRUCE
302 NOTCHING
303 NRC
304 NSR STATISTICS
305 NTC
306 NURSERIES
307 NUTRIENT ANALYSIS
308 NUTRIENT CYCLING
309 NUTRIENTS
310 OCEANSPRAY
311 OREGON
312 OREGON OAK
313 ORYZALIN
314 OSU
315 OUST
316 OVERSTORY REMOVAL
317 OVERSTORY-UNDERSTORY CONDITIONS
318 OVERTOPPING ASSESSMENT
319 OXADIAZON
320 OXYFLUORFEN
321 PACIFIC NORTHWEST
322 PANICUM
323 PAPER BIRCH
324 PARAFFIN
325 PARAQUAT
326 PAULOWNIA
327 PEACE RIVER
328 PERENNIAL GRASS
329 PEST CONTROL PRODUCTS ACT
330 PESTICIDE REFORMS
331 PHENOXY HERBICIDES
332 PHOTOGRAPHY
333 PHOTOTOXICITY
334 PHYTOTOXICITY
335 PICLORAM
336 PIN CHERRY
337 PINE GRASS
338 PINEWEED
339 PLANNING
340 PLANNING-GUIDELINES
341 PLANTING METHODS
342 POAST
343 POISON OAK
344 POKEWEED
345 POLICY
346 PONDEROSA PINE
347 PONDEROSA PINE

Listing of -A at 22:50:25 on DEC 12, 1988 for CCId=RWSW on G

348 POPULATION ECOLOGY
349 POST-EMERGENCE SPRAY
350 POTLATCH
351 POWELL RIVER
352 PPG-1013
353 PPG-1259
354 PPX-T6378
355 PRE-EMERGENCE SPRAY
356 PRESCRIBED BURNING
357 PRESCRIBED FIRE
358 PRESCRIPTIONS
359 PRINCEP
360 PROBLEM ANALYSIS
361 PROCEEDINGS
362 PROJECT PROPOSAL
363 PROMETRYN
364 PRONAMIDE
365 PRONONE
366 PROPAZINE
367 PROPHYLACTIC MEASURES
368 PROTOCOL
369 PUBLIC ATTITUDES
370 PUBLIC EDUCATION
371 PUBLIC RELATIONS
372 QUAKING ASPEN
373 QUEENSLAND
374 RAGWEED
375 RANGE WEEDS
376 RASPBERRY
377 RED ALDER
378 RED ELDERBERRY
379 RED FIR
380 RED MAPLE
381 RED OAK
382 RED RASPBERRY
383 RED REAPBERRY
384 RED TWINBERRY
385 RED-OSIER DOGWOOD
386 REDROOT
387 REDSTEM CEANOTHUS
388 REFLEX
389 REGENERATION
390 REGENERATION COSTS
391 RELEASE TREATMENTS
392 REPLACEMENT SERIES
393 RESEARCH PRIORITIES
394 RESEARCH REVIEW
395 RESEARCH STRATEGIES
396 RESIDUE ANALYSIS
397 RHODODENDRON
398 RIBES
399 RIGHT-OF-WAY
400 RIPARIAN HABITAT
401 RISK ANALYSIS
402 ROCKY MOUNTAIN MAPLE
403 ROOT RESEARCH
404 ROSE
405 ROUNDUP
406 ROW WEED CONTROL
407 RUBUS LACINIATUS
408 RUBUS PROCERUS
409 RUNOFF
410 S. INTERIOR
411 SALAL
412 SALMONBERRY
413 SASSAFRAS
414 SC 0774
415 SCALPING
416 SCARIFICATION
417 SCEPTER
418 SCHIRP
419 SCOTCHBROOM
420 SCOTS PINE
421 SCREEFING
422 SC0051
423 SC0574
424 SC0774
425 SECTION 88
426 SEDGE
427 SERVICEBERRY
428 SETHOXYDIM
429 SFU
430 SHASTA RED FIR
431 SHEEP
432 SHELTERWOODS
433 SHRUB PHENOLOGY
434 SILVER MAPLE
435 SILVEX
436 SILVICULTURAL BENEFITS
437 SILVICULTURAL TREATMENTS
438 SIMAZINE
439 SINBAR
440 SISCO
441 SITE FACTORS
442 SITE PREPARATION
443 SITE PREPARATION EQUIPMENT
444 SITE PREPARATION-CHEMICAL
445 SITE PREPARATION-MECHANICAL
446 SITKA ALDER
447 SITKA SPRUCE
448 SIUSLAW NATIONAL FOREST
449 SKEENA RIVER
450 SLASH PINE
451 SLASHBURNING
452 SLICKLEAF CEANOTHUS
453 SNOWBERRY
454 SNOWBRUSH
455 SOIL MOVEMENT
456 SOIL NUTRIENTS
457 SOIL RESIDUES
458 SOIL RESPONSES
459 SOIL TOXICITY
460 SOIL WATER POTENTIAL
461 SOUTHEASTERN USA
462 SPACING EXPERIMENTS
463 SPIKE
464 SPOT TREATMENTS
465 SPRAY DEPOSITS
466 SPRAY TECHNOLOGY
467 SPRUCE
468 ST. JOHN'S WORT
469 STAND MANAGEMENT
470 STAND RELEASE
471 STEM INJECTIONS
472 STINK CURRANT
473 STOCK CONTROL
474 STREAM CHEMISTRY
475 STREAMWATER NUTRIENTS
476 STREAMWATER QUALITY
477 STREAMWATER RESIDUES
478 STUMP TREATMENT
479 SUCCESSION
480 SUGAR PINE
481 SULFOMETURON
482 SULFOMETURON METHYL
483 SUMACS
484 SURFACTANT
485 SWEDEN
486 SWEET GUM
487 SWORD FERN
488 TANDEX
489 TANOAK
490 TCA
491 TCDD
492 TEBUTHIURON
493 TERBACIL
494 THIMBLEBERRY
495 THIN-LINE APPLICATIONS
496 THINNING
497 THIRAM
498 TORDON
499 TORDON 101
500 TORDON-2
501 TOXICITY
502 TOXICITY TESTING
503 TOXICOLOGY
504 TREATMENT OPTIONS
505 TREATMENT PRIORITIES
506 TREATMENT SELECTION
507 TREMBLING ASPEN
508 TRIADIMEFON
509 TRIAZINE HERBICIDES
510 TRIAZINES
511 TRICLOPYR
512 UOST
513 USDA
514 VACCINIUM
515 VARNISHLEAF CEANOTHUS
516 VEGETATION MANAGEMENT GENERAL
517 VEGETATIVE REPRODUCTION
518 VELPAR
519 VELPAR L
520 VELPAR ULV
521 VERDICT

Listing of -A at 22:50:25 on DEC 12, 1988 for CCId=RWSW on G

522	VINE MAPLE
523	VISION
524	VORLEX
525	WATER
526	WATER STRESS
527	WEED ASSESSMENT
528	WEED AUTECOLOGY
529	WEED DENSITY
530	WEED PHYSIOLOGY
531	WEED RESPONSE
532	WEED SURVEYS
533	WEEDONE
534	WESTERN HAZEL
535	WESTERN HEMLOCK
536	WESTERN LARCH
537	WESTERN RED CEDAR
538	WESTERN REDCEDAR
539	WESTERN SPRUCE
540	WESTERN WHITE PINE
541	WHITE ASH
542	WHITE BIRCH
543	WHITE FIR
544	WHITE PINE
545	WHITE SPRUCE
546	WILD ROSE
547	WILDLIFE
548	WILLOW
549	WOODY WEED CONTROL
550	WORKING PLAN
551	YIELD FORCASTING
552	YIELD RESPONSES
553	ZECTRAN
554	1,3-DICHLOROPROPENE
555	2,2-D
556	2,2-DPA
557	2,4-D
558	2,4-D AMINE
559	2,4-D ESTER
560	2,4-DP
561	2,4,5-T
562	25 YEAR STUDY
563	5 YEAR STUDY
564	8 YEAR STUDY